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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Mobile Standards Group (MSG).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document defines Interoperability Test Descriptions for the NG eCall High Level Application Protocol (HLAP).

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 124 229 (V14.10.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229 version 14.10.0 Release 14)".

[2] ETSI TS 123 167 (V14.6.0): "Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS) emergency sessions (3GPP TS 23.167 version 14.6.0 Release 14)".

[3] ETSI TS 123 228 (V14.6.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS); Stage 2 (3GPP TS 23.228 version 14.6.0 Release 14)".

[4] CEN TS 17184:2018: "Intelligent transport systems - eSafety - eCall High level application Protocols (HLAP) using IMS packet switched networks".

[5] EENA Technical Committee Document: "Next Generation eCall".

[6] ETSI TS 123 401 (V14.10.0): "LTE; General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access (3GPP TS 23.401 version 14.10.0 Release 14)".

[7] CEN EN 16072:2015: "Intelligent transport systems - eSafety - Pan European eCall - Operating requirements".

[8] IETF RFC 8147: "Next-Generation Pan-European eCall".

[9] ETSI TS 103 428 (V1.1.1): "Mobile Standards Group (MSG); eCall HLAP Interoperability Testing".

[10] CEN EN 15722:2015: "Intelligent transport systems - ESafety - Ecall minimum set of data".

[11] ETSI TS 122 101 (V14.7.0): "Universal Mobile Telecommunications System (UMTS); LTE; Service aspects; Service principles (3GPP TS 22.101 version 14.7.0 Release 14)".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI ETR 266: "Methods for Testing and Specification (MTS); Test Purpose style guide".

[i.2] CEN EN 16062:2011: "Intelligent Transport Systems - eSafety - eCall - High Level Application Requirements (HLAP)".

[i.3] ETSI EG 202 798 (V1.1.1): "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".

[i.4] PlantUML.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

base specification: specification of a protocol, telecommunication service, interface, abstract syntax, encoding rules, or information object

eCall: manually or automatically initiated emergency call, (TS12) from a vehicle, supplemented with a minimum set of emergency related data (MSD), as defined under the EU Commission's eSafety initiative

eCall Over IMS support (ECL): As indicated by the eCall support indicator defined in ETSI TS 123 401 [6].

implementation: instance of the reference specification for which conformity to that reference specification is claimed

IMS eCall: eCall deployed using IMS emergency call in 3GPP Release-14, instead of in-band modem and circuit switched 112

NOTE: This definition is taken from EENA Technical Committee Document [5].

IMS Emergency Service support (EMS): IMS Emergency Services supported as indicated by Emergency Service Support indicator as defined in ETSI TS 123 401 [6].

In-band modem eCall: eCall deployed using in-band modem and circuit switched 112 according to CEN EN 16062:2011 [i.2] and CEN EN 16072:2015 [7]

NOTE: This definition is based on definition in EENA Technical Committee Document [5].

IVS configured for eCall only service (restricted): eCall capable IVS that is not subscribed to other non-emergency services

NOTE: The IVS is not permitted to register on a PLMN except for the purpose of making an eCall, or a test/reconfiguration call to a designated non-emergency number, in accordance with ETSI TS 122 101 [11]. Following power-up the IVS may perform a PLMN search and maintain a list of available networks upon which to register, when an eCall or test/reconfiguration call is activated. Following an eCall or test/reconfiguration call, the IVS de-registers from the serving network within 12 hours.

IVS configured for eCall and other services (unrestricted): eCall capable IVS that has valid subscriptions to access other non-emergency services

NOTE: The IVS may register on a PLMN at any time and may remain registered on a serving network indefinitely.

Minimum Set of Data (MSD): data component of an eCall sent from a vehicle to a Public Safety Answering Point or other designated emergency call centre

NOTE: The MSD has a maximum size of 140 bytes and includes, for example, vehicle identity, location information and time-stamp, as defined in CEN EN 15722:2015 [10].

Next Generation eCall (**NG eCall):** based on IMS eCall and offering data, multimedia and two-way data

NOTE: This definition is based on definition in EENA Technical Committee Document [5].

Plugfest: interoperability testing event about a standard or a profile where the participants test each other their implementation

PSAP eCall Modem-server: PSAP equipment used to receive, validate and acknowledge the MSD sent from an IVS, to manage the voice call transfer to the PSAP operator and to facilitate callback to the vehicle

NOTE: The eCall modem-server may also support other functions.

reference specification: standard which provides a base specification, or a set of base specifications, or a profile, or a set of profiles, and for conformance to which the ICS proforma and test specifications are written

VoIMS: voice over IMS over PS sessions support as indicated by IMS Voice over PS session supported indication as defined in ETSI TS 123 401 [6]

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3GPP	Third Generation Partnership Project
ACK	ACKnowledgement
CEN	Comité Européen de Normalisation
CFG	ConFiGuration
CS	Circuit Switched
CSCF	Call Session Control Function
E-CSCF	Emergency CSCF
E-UTRAN	Enhanced UMTS Terrestrial Radio Access Network
ECL	eCall Over IMS support
EMS	IMS Emergency Services
ETR	ETSI Technical Report
ETSI	European Telecommunications Standards Institute
EU	European Union
EUT	Equipment Under Test
GIBA	GPRS-IMS-Bundled-Authentication
GSM	Global System of Mobile telecommunications
HLAP	High Level Application Protocol
HMI	Human Machine Interface
HPLMN	Home PLMN
HSS	Home Subscriber Server
I-CSCF	Interrogating CSCF
IFS	Interoperable Functions Statement
IFS_ID	IFS Identifier
IMEI	International Mobile Equipment Identity

IMS	IP Multimedia Subsystem
IVS	In Vehicle System
LTE	Long Term Evolution
MNO	Mobile Network Operator
MSD	Minimum Set of Data
NACK	Negative Acknowledgement
NG	Next Generation
P-CSCF	Proxy CSCF
PLMN	Public Land Mobile Network
PS	Packet Switched
PSAP	Public Service Answering Point
S-CSCF	Serving CSCF
SIP	Session Initiation Protocol
TD	Test Description
TS11	Teleservice No 11 (Telephony)
TS12	Teleservice No 12 (Emergency Calls)
UMTS	Universal Mobile Telecommunications System
URN	Unique Resource Name
VoIMS	Voice over IMS
VoLTE	Voice over LTE
VPLMN	Visited PLMN

4 Conventions

4.1 Interoperability test process

4.1.1 Principles

The goal of interoperability tests is to check that devices resulting from protocol implementations are able to work together and provide the functionalities provided by the protocols. As necessary, one message may be checked during a test, when a successful functional verification may result from an incorrect behaviour for instance. Detailed protocol checks are part of the conformance testing process and are thus avoided during the interoperability tests.

4.1.2 The test description proforma

The test descriptions are provided in proforma tables following the format described in ETSI EG 202 798 [i.3] and ETSI ETR 266 [i.1]. The following different test event types are considered during the test execution:

- A **stimulus** corresponds to an event that enforces an EUT to proceed with a specific protocol action, like sending a message for instance.
- A **verify** consists of verifying that the EUT behaves according to the expected behaviour (for instance the EUT behaviour shows that it receives the expected message).
- A **configure** corresponds to an action to modify the EUT configuration.
- A **check** ensures the receipt of protocol messages on reference points, with valid content. This "check" event type corresponds to the interoperability testing with conformance check method.

4.1.3 Interoperable Functions Statement

The "Interoperable Functions Statement" (IFS) identifies the standardized functions of an EUT. These functions can be mandatory, optional or conditional (depending on other functions), and depend on the role played by the EUT.

The IFS can also be used as a pro-forma by a vendor to identify the functions that its EUT will support when interoperating with corresponding functions from other vendors.

Item column

The item column contains a number, which identifies the item.

Item description column

The item description column describes in free text each respective item (e.g. parameters, timers, etc.). It implicitly means "is <item description> supported by the implementation?".

IFS ID column

The IFS ID column defines an identifier for this particular IFS item. The IFS ID is in the Test Description field "Applicability" to select/deselect the execution of a test.

Status column

The following notations are used for the status column:

m	mandatory - the capability is required to be supported.
o	optional - the capability may be supported or not.
n/a	not applicable - in the given context, it is impossible to use the capability.
x	prohibited (excluded) - there is a requirement not to use this capability in the given context.
o.i	qualified optional - for mutually exclusive or selectable options from a set. "i" is an integer which identifies an unique group of related optional items and the logic of their selection which is defined immediately following the table.
c.i	conditional - the requirement on the capability ("m", "o", "x" or "n/a") depends on the support of other optional or conditional items. "i" is an integer identifying an unique conditional status expression which is defined immediately following the table.
i	irrelevant (out-of-scope) - capability outside the scope of the reference specification. No answer is requested from the supplier.

NOTE: This use of "i" status is not to be confused with the suffix "i" to the "o" and "c" statuses above.

Support column

The support column shall be filled in by the supplier of the implementation using the following notations:

Y or y	supported by the implementation.
N or n	not supported by the implementation.
N/A or n/a	no answer required (allowed only if the status is n/a, directly or after evaluation of a conditional status).

4.2 Tooling

Message monitoring solutions, including audio recording and event logging, where supported, may be used to facilitate the resolution of any interoperability and/or performance issues that may be encountered during interoperability testing.

4.3 Test Description naming convention

Table 1: TD naming convention

TD_<root>_[gr]_<nn>		
<root> = root applicability	BAS	Basic test
	ADV	Advanced test
[gr] = group	IVS	IVS eCall terminal
	PSAP	PSAP eCall server
		IVS or PSAP
<nn> = sequential number	01 to 99	Sequential numbers

4.4 Test Summary

The detailed test descriptions are defined in the clause 7. It is recommended to conduct all test cases supported by PSAP and IVS. Some of test cases require a fallback to CS (legacy) eCall. The interoperability test cases for CS domain are specified in ETSI TS 103 428 [9].

The test scenarios of the present document are split in 4 groups:

1) The basic scenarios, which shall be executed during all interoperability test sessions, covering the mandatory features of a NG eCall device (IVS and PSAP).

2) The advanced test scenarios, to do additional testing which goes beyond the basic test scenarios. These scenarios are focusing on IVS and PSAP features.

3) The advanced IVS test scenarios, to do additional testing which goes beyond the basic test scenarios. These scenarios are focusing only on IVS features.

4) The advanced PSAP test scenarios, to do additional testing which goes beyond the basic test scenarios. These scenarios are focusing only on PSAP features.

The basic test scenarios in Table 2 are foreseen to be executed during all interoperability test sessions, either with real IVS and PSAP, but also with testing devices simulating an IVS or a PSAP.

Table 2: Basic Tests

Test case ID	Title
TD_BAS_01	Initiation of manual eCall
TD_BAS_02	Initiation of automatic eCall
TD_BAS_03	Initiation of test eCall
TD_BAS_04	MSD transfer to PSAP supporting IMS eCall
TD_BAS_05	MSD transfer to PSAP supporting IMS eCall in roaming scenario
TD_BAS_06	PSAP initiated callback to IVS and MSD update
TD_BAS_07	PSAP initiated call clear-down
TD_BAS_08	IVS initiated call clear-down not allowed
TD_BAS_09	Verification of audio interfaces of IVS and PSAP
TD_BAS_10	MSD update on request from PSAP
TD_BAS_11	IVS behaviour after unsuccessful MSD update
TD_BAS_12	IVS behaviour after unacknowledged MSD update
TD_BAS_13	Format of encoded and decoded MSD in accordance with CEN EN 15722:2015 [10]
TD_BAS_14	MSD transfer via in-band modem to PSAP supporting IMS eCall

The advanced test scenarios in Tables 3, 4 and 5 are foreseen to do additional testing which goes beyond the basic test scenarios.

Table 3: Advanced Tests for PSAP and IVS

Test case ID	Title
TD_ADV_01	MSD transfer to PSAP supporting IMS eCall over IPv4
TD_ADV_02	MSD transfer to PSAP supporting IMS eCall over IPv6
TD_ADV_03	MSD transfer to PSAP supporting IMS eCall over IPv4(IVS)/IPv6(PSAP)
TD_ADV_04	MSD transfer to PSAP not supporting IMS eCall
TD_ADV_05	IMS eCall establishment with IMS emergency registration
TD_ADV_06	IMS eCall establishment without IMS emergency registration
TD_ADV_07	IMS eCall establishment without IMS emergency registration GIBA supported

Table 4: Advanced Tests for IVS

Test case ID	Title
TD_ADV_IVS_01	Fallback to legacy eCall following busy during call setup
TD_ADV_IVS_02	Fallback to legacy eCall following unavailable response during call setup
TD_ADV_IVS_03	Fallback to legacy eCall following no-answer during call setup
TD_ADV_IVS_04	Dropped eCall after MSD has been acknowledged
TD_ADV_IVS_05	Dropped eCall before call has been established
TD_ADV_IVS_06	IVS configured for 'eCall only' service (restricted)
TD_ADV_IVS_07	eCall is attempted when no networks are available (limited service condition with forbidden PLMN on SIM/USIM)
TD_ADV_IVS_08	MSD transfer to PSAP supporting IMS eCall via PLMN without VoIMS support
TD_ADV_IVS_09	Termination of manually triggered eCall by vehicle occupant
TD_ADV_IVS_10	Termination of automatically triggered eCall by vehicle occupant not allowed/not possible
TD_ADV_IVS_11	Ongoing eCall shall not be disconnected if new trigger is received

Table 5: Advanced Tests for PSAP

Test case ID	Title
TD_ADV_PSAP_01	PSAP handling of more than 1 eCall simultaneously
TD_ADV_PSAP_02	PSAP correct MSD additional data decoding
TD_ADV_PSAP_03	Rerouting to another PSAP/emergency control centre
TD_ADV_PSAP_04	PSAP operator user interface

5 Test Bed Architecture

5.1 Test site layout

The generic test bed used to carry out interoperability tests, is summarized in the below Figure 1.

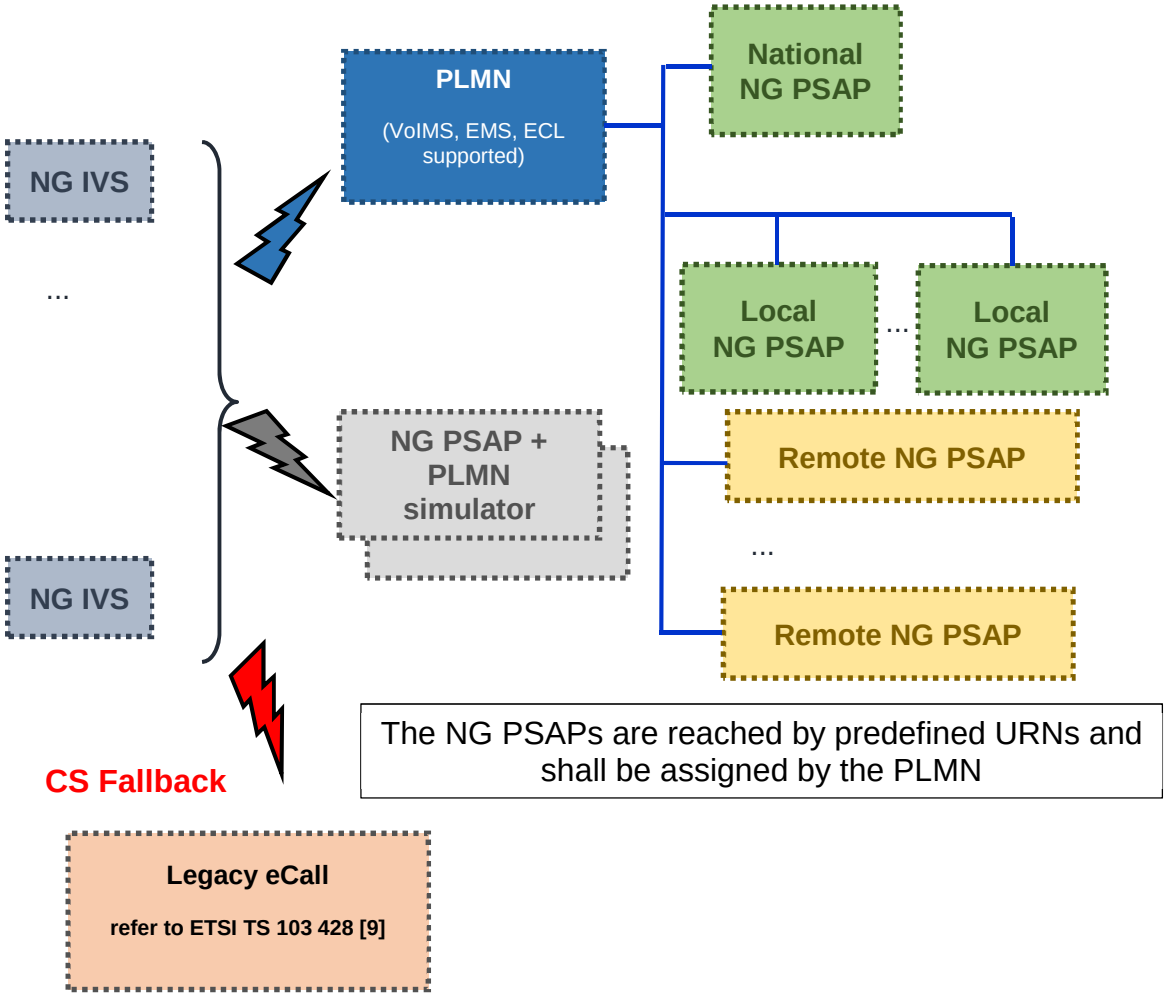

Figure 1: Architecture

In normal operation conditions, the NG IVS establishes an NG eCall via correct URN. This call setting is then interpreted by the mobile network (PLMN) as a requirement to connect the NG IVS with the most appropriate NG PSAP, able to handle NG eCalls, accordingly to CEN TS 17184:2018 [4].

However, during an NG eCall interoperability event, an NG IVS needs to be connected to a given NG PSAP in order to carry out pairing test sessions, following the test scenarios provided in the present document. The selection of the NG PSAP is therefore achieved by the use of the pre-defined URNs (see Table 6), if supported (configured) by the PLMN operator.

For the purpose of carrying out tests under real conditions, different options are available:

- Using test systems providing PLMN and NG PSAP simulation (connection in shielded cases or via cable).
- Using different non-standardized URNs, if the local authorities do not allow using the standardized URNs connections and thus reaching the real PSAP.

Table 6: NG eCall Types and related URNs

NG eCall Type	NG eCall URNs IETF RFC 8147 [8]	Proposed Plugfest URNs
Manual	urn:service:sos.ecall.manual	urn:service:test.sos.ecall.manual.psap1 urn:service:test.sos.ecall.manual.psap2 .. urn:service:test.sos.ecall.manual.psapn
Automatic	urn:service:sos.ecall.automatic	urn:service:test.sos.ecall.automatic.psap1 urn:service:test.sos.ecall.automatic.psap2 .. urn:service:test.sos.ecall.automatic.psapn
Test	urn:service:test.sos.ecall	urn:service:test.sos.ecall.psap1 urn:service:test.sos.ecall.psap2 .. urn:service:test.sos.ecall.psapn
NOTE: Not every IVS may support proposed Plugfest URNs.		

5.2 NG eCall HLAP flow diagram

An NG IVS should register to the network by performing the attach procedure. NG IVS may perform IMS registration if used for other services then eCall. When NG eCall is triggered, an NG IVS will perform IMS emergency registration procedure as shown in Figure 2.

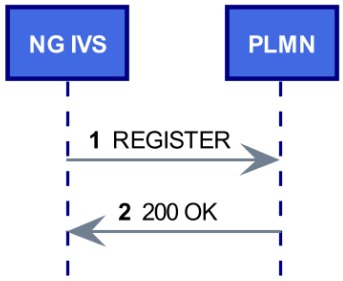

Figure 2: IMS emergency registration

1) NG IVS sends REGISTER to the PLMN.

2) NG IVS receives 200 OK from the PLMN.

After the IMS emergency registration procedure the NG IVS initiates an IMS eCall as shown in Figure 3.

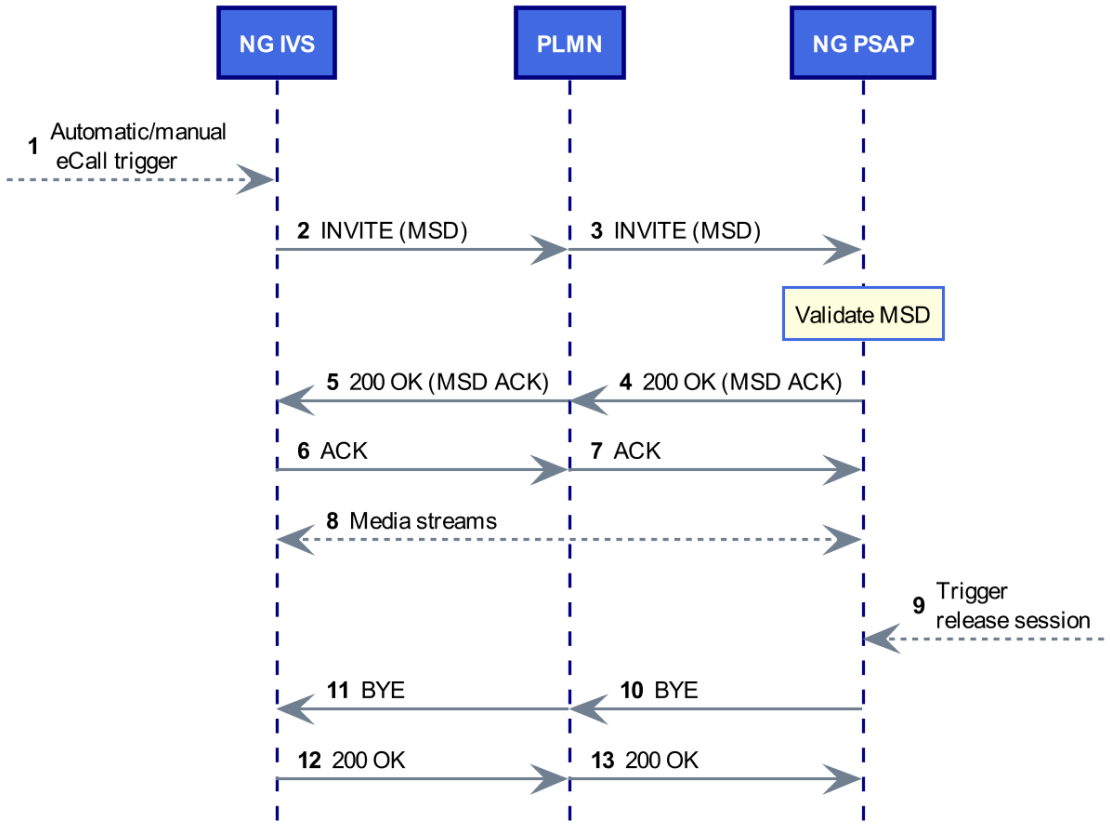

Figure 3: eCall session

1) The NG IVS receives a trigger to establish a manual or automatic NG eCall.
2) An initial emergency INVITE is sent to the PLMN. The INVITE shall contain the initial MSD and the eCall type of emergency service indicator (automatic, manual).
3) The PLMN network routes the INVITE towards the appropriate NG PSAP.
4) The NG PSAP verifies the correctness of the initial MSD and returns a 200 OK, which includes a positive or negative acknowledgement for the initial MSD.
5) The PLMN network sends the 200 OK to the NG IVS.
6) The NG IVS sends ACK for the 200 OK INVITE.
7) The NG PSAP receives ACK for the 200 OK INVITE from the PLMN.
8) The emergency call establishment is completed. The established media channel supports bidirectional voice communication.
9) Only the NG PSAP is able to release the session.
10) The NG PSAP sends BYE towards PLMN.
11) PLMN routes BYE towards NG IVS.
12) NG IVS confirms session release and sends the 200 OK BYE to the PLMN.
13) PLMN forwards 200 OK to the NG PSAP.

Figure 4 illustrates when 2-way-speech is established and during the call, the NG PSAP sends a request for an MSD update in an INFO request. The NG IVS sends the updated MSD in a new INFO request.

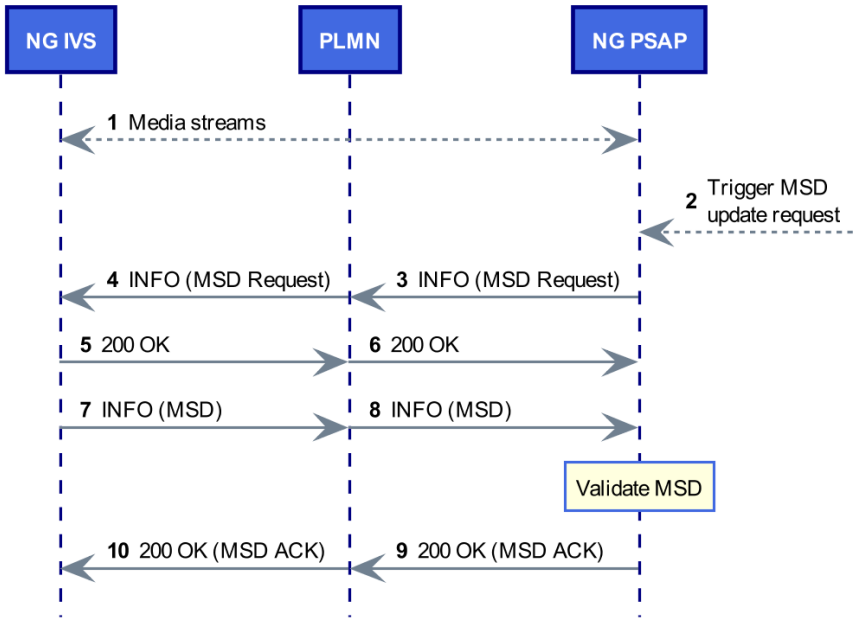

Figure 4: PSAP requests MSD update

1) The emergency call establishment is completed. The established media channel supports bidirectional voice communication.
2) NG PSAP triggers MSD update request.
3) NG PSAP sends a request for an MSD in an INFO request towards NG IVS.
4) NG IVS receives request for an MSD update.
5) NG IVS confirms the reception of the request with 200 OK INFO.
6) NG PSAP receives 200 OK INFO.
7) NG IVS sends new INFO with updated MSD towards NG PSAP.
8) NG PSAP receives INFO with updated MSD and validates it.
9) NG PSAP sends 200 OK INFO, which includes a positive or negative acknowledgement for the update MSD.
10) The PLMN network routes the 200 OK INFO to the NG IVS.

6 Test Configurations

6.0 Introduction

The following clauses define multiple test configurations, which reflect the cases A and D from the Table H.2 in ETSI TS 123 167 [2].

6.1 Home Interoperability Test Configuration

Interoperability tests will be performed using the setup shown in Figure 5. The HPLMN shall indicate support of Voice over IMS over PS sessions (VoIMS), IMS Emergency Services (EMS) and eCall Over IMS (ECL). Ancillary measurement and message logging equipment is not shown but may be used, with the agreement of the participants, to help identify the likely cause of any interoperability test failures that may arise.

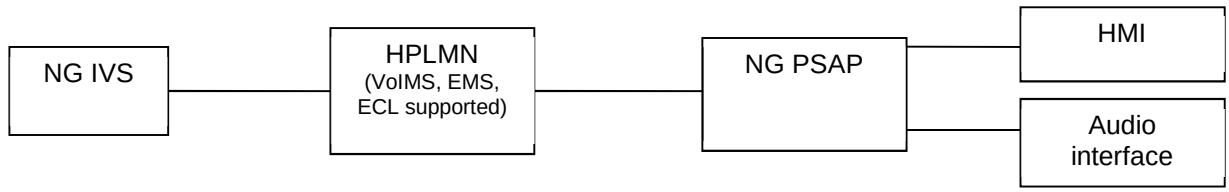

Figure 5: NG_eCall_CFG_01

NG IVS, HPLMN and NG PSAP can be either real devices or simulators. PSAP simulator is understood to be only simulating the PSAP connected to the public network with fixed line connection (SIP trunk).

NOTE: To switch between NG_eCall_CFG_01 (Home) and NG_eCall_CFG_03 (Visited) configuration simply change the NG IVS USIM card.

6.2 Home Interoperability Test Configuration with fallback to legacy eCall

Interoperability tests will be performed using the setup shown in Figure 6. Ancillary measurement and message logging equipment is not shown but may be used, with the agreement of the participants, to help identify the likely cause of any interoperability test failures that may arise.

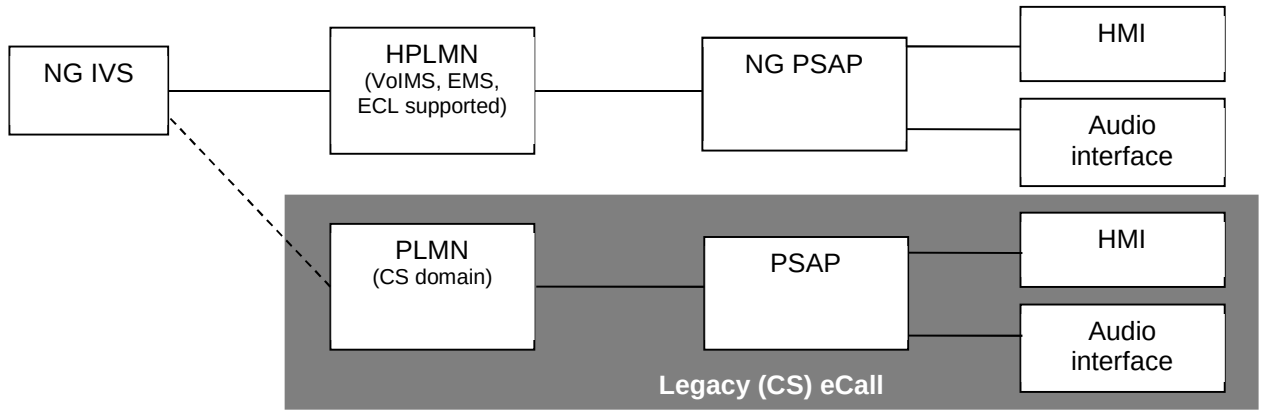

Figure 6: NG_eCall_CFG_02

NG IVS, HPLMN, PLMN, NG PSAP and PSAP can be either real devices or simulators.

6.3 Visited Interoperability Test Configuration

This configuration is used to represent a roaming scenario. Interoperability tests will be performed using the setup shown in Figure 7. Ancillary measurement and message logging equipment is not shown but may be used, with the agreement of the participants, to help identify the likely cause of any interoperability test failures that may arise.

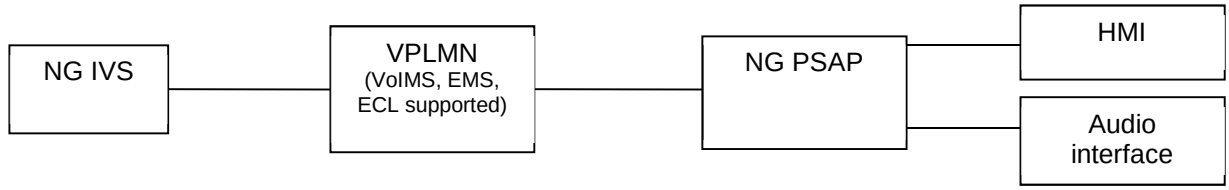

Figure 7: NG_eCall_CFG_03

NG IVS, VPLMN and NG PSAP can be either real devices or simulators. PSAP simulator is understood to be only simulating the PSAP connected to the public network with fixed line connection (SIP trunk).

6.4 Multiple IVS Interoperability Test Configuration

In the Interoperability test configuration NG_eCall_CFG_04, more than one NG IVS will repetitively call the same NG PSAP to simulate a real service. The NG PSAP shall be able to handle a certain number of parallel emergency calls and route them to a certain number of operator phones.

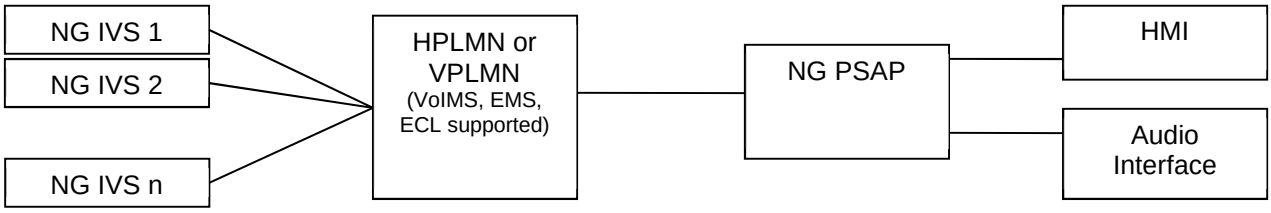

Figure 8: NG_eCall_CFG_04

6.5 Home Interoperability Test Configuration rerouting to another PSAP

Interoperability tests will be performed using the setup shown in Figure 9. Ancillary measurement and message logging equipment is not shown but may be used, with the agreement of the participants, to help identify the likely cause of any interoperability test failures that may arise.

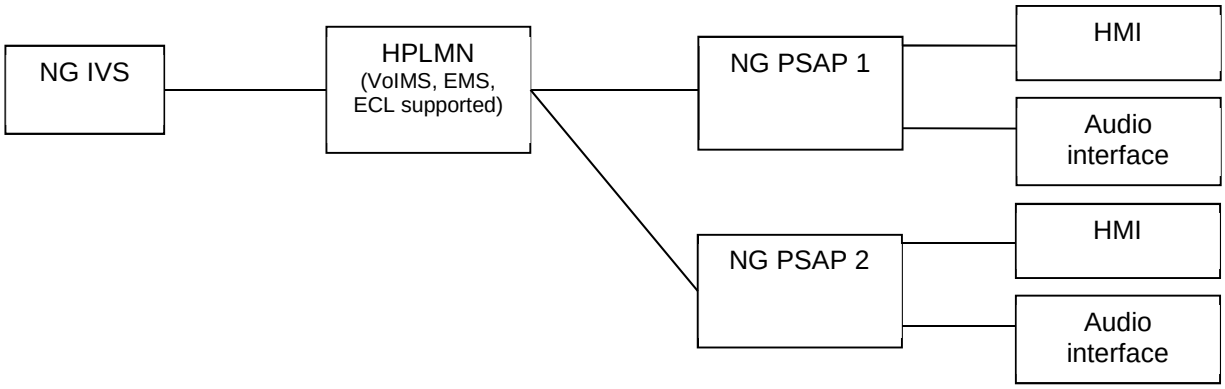

Figure 9: NG_eCall_CFG_05

NG IVS, HPLMN, NG PSAP 1 and NG PSAP 2 can be either real devices or simulators. PSAP simulator is understood to be only simulating the PSAP connected to the public network with fixed line connection (SIP trunk).

6.6 Home Interoperability Test Configuration without VoIMS support

Following test configuration reflects the case D from Table H.2 in ETSI TS 123 167 [2]. The HPLMN shall indicate support of IMS Emergency Services (EMS) and eCall Over IMS (ECL) and shall not indicate support of Voice over IMS over PS sessions (VoIMS).

Interoperability tests will be performed using the setup shown in Figure 10. Ancillary measurement and message logging equipment is not shown but may be used, with the agreement of the participants, to help identify the likely cause of any interoperability test failures that may arise.

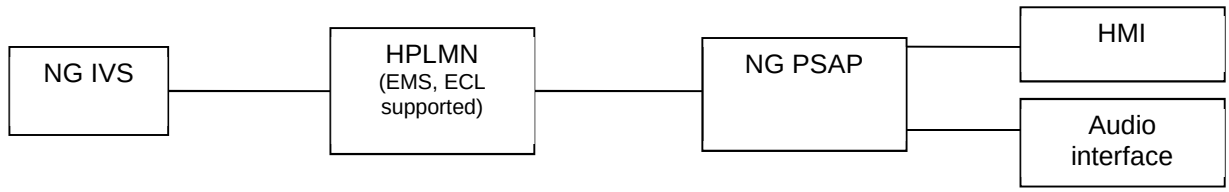

Figure 10: NG_eCall_CFG_06

NG IVS, HPLMN and NG PSAP can be either real devices or simulators. PSAP simulator is understood to be only simulating the PSAP connected to the public network with fixed line connection (SIP trunk).

6.7 Default pre-test conditions

The following default pre-test conditions apply to all tests unless otherwise stated in the test cases description:

1) Ignition is ON and NG IVS is in mobile network coverage
2) NG MNO and NG PSAP test points are available
3) NG IVS registered to the PLMN (HPLMN or VPLMN)
4) NG IVS has all the information needed to compile the MSD
5) NG IVS configured to support IMS communication profile
6) NG IVS contains USIM

6.8 Interoperable Functions Statement (IFS)

All IFS items referred to in this clause are as specified in CEN TS 17184:2018 [4] unless indicated otherwise by another numbered reference.

Table 7: PSAP features

Item	Entity	IFS_ID	Reference	Status	Support
1	PSAP supports IMS-eCall	PSAP_ims_eCall	7.1.3	m	
2	PSAP supports legacy CS in-band eCall	PSAP_legacy_eCall	7.1.3	m	
3	PSAP supports IPv4	PSAP_IPv4	7.1.3	m	
4	PSAP supports IPv6	PSAP_IPv6	7.1.3	m	
5	PSAP supports voice communication	PSAP_speech	7.1.	m	
6	PSAP supports simultaneous eCalls	PSAP_simult_eCalls	7.8.1	o	
7	PSAP supports callback	PSAP_callback	7.11	m	
8	PSAP supports request MSD update or new MSD	PSAP_MSD_update	7.7.1 item 1	m	
9	PSAP supports reception of MSD via in-band modem within the IMS eCall	PSAP_MSD_usingInBand_ via_VoLTE	7.3.6	m	

Table 8: IVS features

Item	Entity	IFS_ID	Reference	Status	Support
1	IVS supports IMS-eCall	IVS_ims_eCall	7.1.2	m	
2	IVS supports legacy CS in-band eCall	IVS_legacy_eCall	7.1.2	m	
3	IVS supports automatic eCall activation	IVS_auto_eCall	7.3.6	m	
4	IVS supports manual eCall activation	IVS_man_eCall	7.3.6	m	
5	IVS supports test call	IVS_test_eCall	7.1.5	m	
6	IVS supports eCall only	IVS_eCall_only	7.1.4	o	
7	IVS supports IPv4	IVS_IPv4	7.1.2	m	
8	IVS supports IPv6	IVS_IPv6	7.1.2	m	
9	IVS supports voice communication	IVS_speech	7.1.	m	
10	IVS supports MSD version 2	IVS_MSDv2	7.5.1	m	
11	IVS supports additional MSD data	IVS_add_MSD_data	7.5.1	o	
12	IVS supports PSAP callback	IVS_callback	7.11	m	
13	IVS supports transfer of MSD update or new MSD	IVS_MSD_update	7.7.1 item 3	m	
14	IVS supports transfer of MSD via in-band modem within the IMS eCall	IVS_MSD_usingInBand_ via_VoLTE	7.3.6	m	
15	IVS supports GIBA procedure	IVS_GIBA	ETSI TS 124 229 [1]	o	

7 NG eCall test scenarios/descriptions

7.0 Introduction

The tests defined in the present document shall be performed according to the test applicability. The test applicability is defined in each test in the field 'Applicability' and is expressed with IFS statements. The tests apply to IVS and PSAP as well as to IVS and PSAP simulators.

Following test descriptions are covering IMS eCall scenarios and some CS eCall fallback scenarios. Legacy CS eCall test descriptions are specified in ETSI TS 103 428 [9].

7.1 Basic test scenarios

7.1.1 Initiation of manual eCall

Interoperability Test Description			
Identifier:	TD_BAS_01		
Objective:	Verify that the IVS is able to initiate a manual eCall containing INVITE request indicating service URN value. Verify that the received MSD contains the correct eCall initiation indicator for a manually triggered eCall.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.1.2 and 7.3.6 of CEN TS 17184:2018 [4] Clause 14.2 of IETF RFC 8147 [8] Clause 6.3.2 of CEN EN 15722:2015 [10]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_man_eCall		
Pre-test conditions:	Default see clause 6.7 (see note 2)		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates a manual eCall
	2	check	Open the received INVITE request and check if service URN contains "urn:service:sos.ecall.manual" (see note 1)
	3	verify	PSAP verifies the MSD (in an INVITE request) is received
	4	check	Open the received MSD and check if block 3 contains an indication that the eCall was manually initiated (automaticActivation = false)
NOTE 1: Test step 2 is only relevant, if the URN value "urn:service:sos.ecall.manual" is used. NOTE 2: If the PSAP is only reachable via test URN, for testing purposes the URN value "urn:service:test.sos.ecall" should be used instead of the URN value "urn:service:sos.ecall.manual".			

7.1.2 Initiation of automatic eCall

Interoperability Test Description			
Identifier:	TD_BAS_02		
Objective:	Verify that the IVS is able to initiate an automatic eCall containing INVITE request indicating service URN value. Verify that the received MSD contains the eCall initiation indicator for an automatic triggered eCall.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.1.2 and 7.3.6 of CEN TS 17184:2018 [4] Clause 14.2 of IETF RFC 8147 [8] Clause 6.3.2 of CEN EN 15722:2015 [10]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_auto_eCall		
Pre-test conditions:	Default see clause 6.7 (see note 2)		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an automatic eCall
	2	check	Open the received INVITE request and check if service URN contains "urn:service:sos.ecall.automatic" (see note 1)
	3	verify	PSAP verifies the MSD (in an INVITE request) is received
	4	check	Open the received MSD and check if block 3 contains an indication that the eCall was automatically initiated (automaticActivation = true)
NOTE 1: Test step 2 is only relevant, if the URN value "urn:service:sos.ecall.automatic" is used. NOTE 2: If the PSAP is only reachable via test URN, for testing purposes the URN value "urn:service:test.sos.ecall" should be used instead of the URN value "urn:service:sos.ecall.automatic".			

7.1.3 Initiation of test eCall

Interoperability Test Description			
Identifier:	TD_BAS_03		
Objective:	Verify that the IVS is able to initiate a test eCall containing INVITE request indicating service URN value "urn:service:test.sos.ecall". Verify that the received MSD contains the correct test eCall indicator for a test eCall (see note).		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.2.2 of CEN TS 17184:2018 [4] Clause 14.2 of IETF RFC 8147 [8] Clause 6.3.2 of CEN EN 15722:2015 [10]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_test_eCall		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates a test eCall
	2	check	Open the received INVITE request and check if service URN contains "urn:service:test.sos.ecall"
	3	verify	PSAP verifies the MSD (in an INVITE request) is received (see note)
	4	check	Open the received MSD and check if block 3 contains an indication that the eCall is a test eCall (testCall = true) (see note)
NOTE: The second test objective and the test steps 3 to 4 are optional until detailed requirements for the MSD transfer in a test eCall become available.			

7.1.4 MSD transfer to PSAP supporting IMS eCall

Interoperability Test Description			
Identifier:	TD_BAS_04		
Objective:	Verify that the IVS is able to transfer the MSD (in an INVITE request) to a PSAP supporting IMS eCall.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.4.1 and 7.4.2 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	Default see clause 6.7: • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	5	check	MSD content at PSAP is identical to content transmitted by IVS
	6	verify	PSAP receives ACK request on 200 OK INVITE response

7.1.5 MSD transfer to PSAP supporting IMS eCall in roaming scenario

Interoperability Test Description			
Identifier:	TD_BAS_05		
Objective:	Verify that the IVS is able to transfer the MSD (in an INVITE request) to a PSAP supporting IMS eCall in roaming scenario.		
Configuration:	NG_eCall_CFG_03		
References:	Clauses 7.3.2, 7.4.1 and 7.4.2 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	Default see clause 6.7: • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	5	check	MSD content at PSAP is identical to content transmitted by IVS
	6	verify	PSAP receives ACK request on 200 OK INVITE response

7.1.6 PSAP initiated callback to IVS and MSD update

Interoperability Test Description			
Identifier:	TD_BAS_06		
Objective:	Verify that if an eCall has been successfully terminated by the PSAP, then the IVS shall answer a PSAP callback and send a MSD update on request of the PSAP.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.7.2 and 7.11 of CEN TS 17184:2018 [4] Clause 7.17.3 of CEN EN 16072:2015 [7]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech AND IVS_callback AND PSAP_callback AND IVS_MSD_update AND PSAP_MSD_update		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	check	PSAP verifies the MSD is correctly decoded (MSD ID = 1)
	4	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	verify	2-way speech can be exchanged
	7	stimulus	PSAP clears down the call (via BYE request)
	8	verify	IVS has cleared down the call (confirmed with 200 OK BYE response)
	9	stimulus	PSAP initiates a callback (via INVITE request) using IVS callback number, SIP identifier or IP address
	10	verify	IVS confirms the call with a 200 OK INVITE response
	11	verify	PSAP sends ACK request on 200 OK INVITE response
	12	verify	2-way speech can be exchanged
	13	stimulus	PSAP sends request (in an INFO request) for MSD update while the 2-way conversation is in progress
	14	verify	PSAP receives 200 OK INFO response
	15	verify	PSAP verifies the MSD update (in an INFO request) is received (see note 1)
	16	check	PSAP verifies the MSD is correctly decoded (MSD ID = 2)
	17	verify	IVS receives a 200 OK INFO response with a positive acknowledgment for the MSD
	18	verify	2-way speech can be exchanged
	19	stimulus	PSAP clears down the call (via BYE request)
	20	verify	IVS has cleared down the call (confirmed with a 200 OK BYE response)
NOTE 1: Step 15 is currently optional, due to the following note in clause 7.7.2 of CEN TS 17184:2018 [4]: *"The IMS eCall solution currently defined in ETSI TS 122 101, ETSI TS 123 167 and IETF eCall RFC 8147 does not support authentication by a vehicle IVS that an incoming call is from a PSAP or use of the procedures defined in 7.4 and 7.5 to enable a PSAP Operator to obtain an updated MSD from an IVS as part of callback from the PSAP.*" NOTE 2: MSC of callback scenario after successfully terminated eCall is shown in Figure 11.			

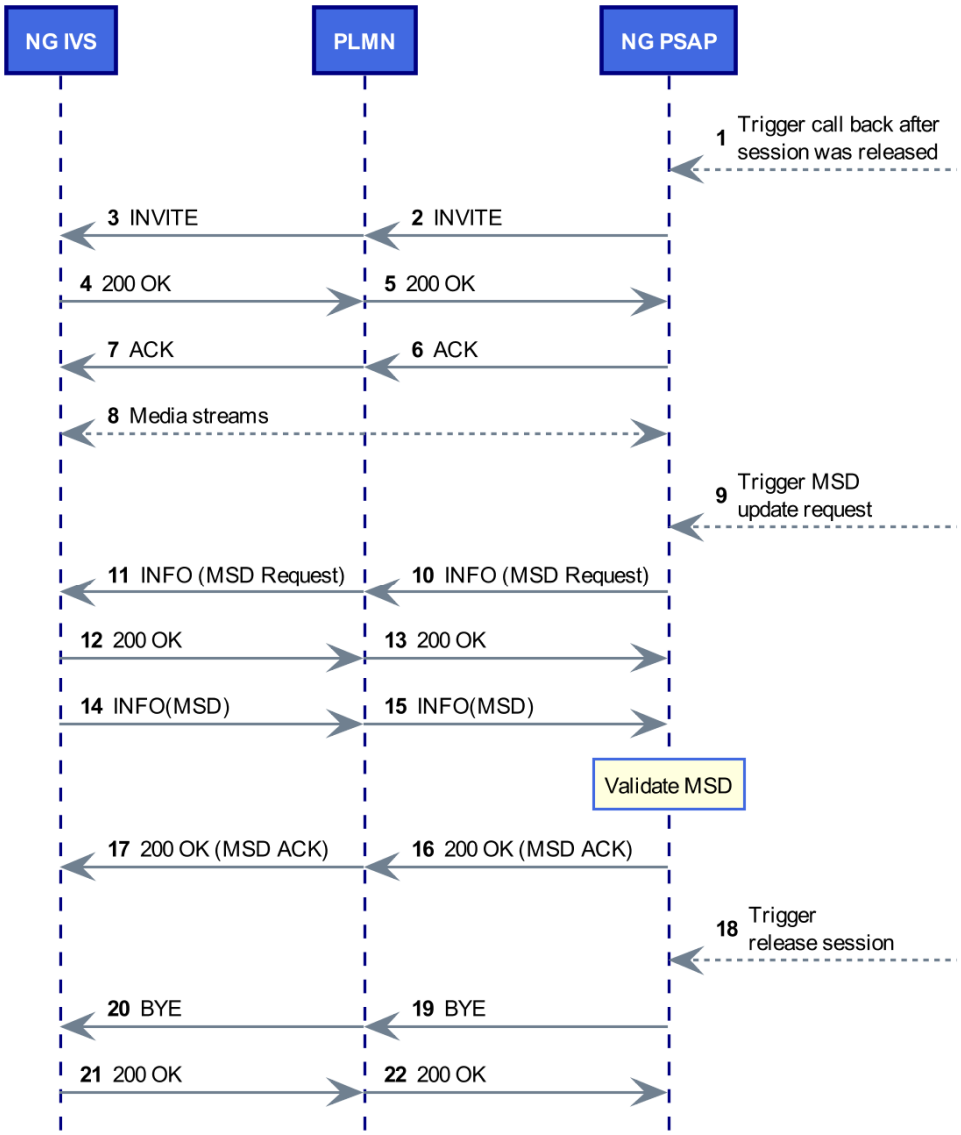

Figure 11: Callback scenario after successfully terminated eCall

1) After NG IVS was registered and the NG eCall was successfully released NG PSAP triggers a callback.
2) An initial INVITE is sent to the PLMN.
3) The PLMN network routes the INVITE towards the NG IVS.
4) The NG IVS returns a 200 OK INVITE to the PLMN.
5) The PLMN network sends the 200 OK INVITE to the NG PSAP.
6) The NG PSAP sends ACK for the 200 OK INVITE.
7) The NG IVS receives ACK for the 200 OK INVITE from the PLMN.
8) The callback establishment is completed. Media channels are established.
9) NG PSAP trigger MSD update request.
10) NG PSAP sends a request for an MSD in an INFO request towards NG IVS.
11) NG IVS receives request for an MSD update.
12) NG IVS confirms the reception of the request with 200 OK INFO.

13) NG PSAP receives 200 OK INFO.

14) NG IVS sends new INFO with updated MSD towards NG PSAP.

15) NG PSAP receives INFO with updated MSD and validate it.

16) NG PSAP sends 200 OK INFO, which includes a positive or negative acknowledgement for the update MSD.

17) The PLMN network routes the 200 OK INFO to the NG IVS.

18) Only NG PSAP is able to release the session.

19) The NG PSAP sends BYE towards PLMN.

20) PLMN routes BYE towards NG IVS.

21) NG IVS confirm session release and sends the 200 OK BYE to the PLMN.

22) PLMN forwards 200 OK to the NG PSAP.

7.1.7 PSAP initiated call clear-down

Interoperability Test Description			
Identifier:	TD_BAS_07		
Objective:	Verify that when the PSAP clears down the call, the IVS also clears down the call following receipt of a BYE request.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.10 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	2-way speech can be exchanged
	5	stimulus	PSAP clears down the call (via BYE request)
	6	verify	IVS has cleared down the call (confirmed with a 200 OK BYE response)
NOTE: An application layer clear-down as defined in CEN EN 16062:2015 [i.2] is not applicable for IMS eCall.			

7.1.8 IVS initiated call clear-down not allowed

Interoperability Test Description			
Identifier:	TD_BAS_08		
Objective:	Verify that when the eCall was established an IVS initiated call clear-down is not allowed before expiry of timer T2.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 6 and Annex A of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	2-way speech can be exchanged
	5	stimulus	IVS attempts to clears down the call (via BYE request) before expiry of timer T2 (see note)
	6	verify	eCall in progress was not disconnected
	7	stimulus	PSAP clears down the call (via BYE request)
	8	verify	IVS has cleared down the call (confirmed with a 200 OK BYE response)
NOTE: A compliant IVS should not be able to clear down the call before expiry of timer T2. This 'negative' test should ensure that the IVS can gracefully handle invalid input or unexpected user behaviour.			

7.1.9 Verification of audio interfaces of IVS and PSAP

Interoperability Test Description			
Identifier:	TD_BAS_09		
Objective:	Verify that the PSAP sends acknowledgement (in the final response to the INVITE), if MSD check is successful. Verify that the IVS and PSAP audio interfaces are connected and 2-way speech is possible between the IVS and PSAP.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.5.1 and 7.9 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS verifies the 200 OK INVITE response with positive acknowledgement for the received MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	verify	2-way speech can be exchanged

7.1.10 MSD update on request from PSAP

Interoperability Test Description			
Identifier:	TD_BAS_10		
Objective:	Verify that the IVS is able to recognize and act upon a request from the PSAP, during ongoing eCall, to send an updated MSD.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.7.1 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech AND IVS_MSD_update AND PSAP_MSD_update		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	check	PSAP verifies the MSD is correctly decoded (MSD ID = 1)
	4	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	verify	2-way speech can be exchanged
	7	stimulus	PSAP sends request (in an INFO request) for MSD update while the 2-way conversation is in progress
	8	verify	PSAP receives 200 OK INFO response
	9	verify	PSAP verifies the MSD update (in an INFO request) is received
	10	check	PSAP verifies the MSD is correctly decoded (MSD ID = 2)
	11	verify	IVS receives a 200 OK INFO response with a positive acknowledgment for the MSD

7.1.11 IVS behaviour after unsuccessful MSD update

Interoperability Test Description			
Identifier:	TD_BAS_11		
Objective:	Verify that the PSAP sends negative acknowledgement (in the final response to the INFO), if MSD check is unsuccessful. Verify that the IVS does not attempt to re-send the MSD unless requested by the PSAP.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.5.2, 7.6 and 7.13.1 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech AND IVS_MSD_update AND PSAP_MSD_update		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives the 200 OK INVITE response with positive acknowledgement for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	verify	2-way speech can be exchanged (see note)
	7	stimulus	PSAP sends request (in an INFO request) for MSD update while the 2-way conversation is in progress
	8	verify	PSAP receives 200 OK INFO response
	9	verify	PSAP verifies the MSD update (in an INFO request) is received
	10	verify	PSAP verifies the MSD check fails
	11	verify	IVS verifies the 200 OK INFO response with negative acknowledgement for the MSD is received
	12	verify	IVS does not attempt to re-send the MSD update
NOTE: After test step 6 the PSAP should be configured to send 200 OK response with NACK for the MSD update.			

7.1.12 IVS behaviour after unacknowledged MSD update

Interoperability Test Description			
Identifier:	TD_BAS_12		
Objective:	Verify that the IVS does not attempt to re-send the MSD unless requested by the PSAP, if a 200 OK INFO response (without acknowledgement for the MSD) is received as response to the MSD update (in an INFO request).		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.5.3 and 7.6¶2 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech AND IVS_MSD_update AND PSAP_MSD_update		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives the 200 OK INVITE response with positive acknowledgement for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	verify	2-way speech can be exchanged (see note)
	7	stimulus	PSAP sends request (in an INFO request) for MSD update while the 2-way conversation is in progress
	8	verify	PSAP receives 200 OK INFO response
	9	verify	PSAP verifies the MSD update (in an INFO request) is received
	10	verify	IVS verifies the 200 OK INFO response (without acknowledgement for the MSD) is received
	11	verify	IVS does not attempt to re-send the MSD
NOTE: After test step 6 the PSAP should be configured to send 200 OK response without ACK/NACK for the MSD update.			

7.1.13 Format of encoded and decoded MSD in accordance with CEN EN 15722:2015

Interoperability Test Description			
Identifier:	TD_BAS_13		
Objective:	Verify that the IVS formats the MSD in accordance with CEN EN 15722:2015 [10] and encodes it correctly, and that the PSAP decodes and displays the MSD correctly.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 6.3.2 of CEN EN 15722:2015 [10] Clause 7.5.1 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_MSDv2		
Pre-test conditions:	Default see clause 6.7: • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives the 200 OK INVITE response with positive acknowledgement for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	check	Visually inspect format, content, logic and accuracy of MSD when decoded and displayed PSAP on screen. Check all MSD fields according to CEN EN 15722:2015 [10]. Mandatory MSD elements: • msdVersion (shall be set to 2) • messageIdentifier (shall be set to 1) • automaticActivation • testCall • positionCanBeTrusted • vehicleType • vehicleIdentificationNumber • gasolineTankPresent • dieselTankPresent • compressedNaturalGas • liquidPropaneGas • electricEnergyStorage • hydrogenStorage • otherStorage • timestamp • vehicleLocation • vehicleDirection Optional MSD elements: • recentVehicleLocationN1 • recentVehicleLocationN2 • numberOfPassengers • optionalAdditionalData

7.1.14 MSD transfer via in-band modem to PSAP supporting IMS eCall

Interoperability Test Description			
Identifier:	TD_BAS_14		
Objective:	Verify that the IVS is able to transfer the MSD via in-band modem to a PSAP supporting IMS eCall.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.3.6 of CEN TS 17184:2018 [4] Clause 5.1.6.11.2 (2nd numbered list/item 1) of ETSI TS 124 229 [1]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_MSD_usingInBand_via_VoLTE AND PSAP_MSD_usingInBand_via_VoLTE AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7: • The PSAP should be configured to send 200 OK INVITE response with a negative acknowledgment for the MSD after step 3 • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives a 200 OK INVITE response with a negative acknowledgment for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	verify	The IVS shall attempt to transfer the MSD to the PSAP via in-band modem within the IMS eCall (see note 1)
	7	verify	PSAP immediately transmits SEND-MSD (START) message without waiting for the valid Initiation Signal (see note 2)
	8	verify	If IVS had started to send an INITIATION message then IVS stopped sending the INITIATION message on receipt of the SEND-MSD message from the PSAP
	9	verify	PSAP verifies MSD is received
	10	verify	Verify the MSD is correctly decoded
	11	check	MSD content at PSAP is identical to content transmitted by IVS
	12	verify	PSAP sends acknowledgement
	13	verify	Verify that the IVS has stopped transmitting the MSD
	14	verify	2-way speech can be exchanged
NOTE 1: The test steps 7 to 13 are copied from clause 7.1.1 of ETSI TS 103 428 [9]. Other tests from ETSI TS 103 428 [9] could also be tested here. NOTE 2: Step 7 is only applicable if the PSAP is configured in PULL mode and should be skipped, if PSAP is configured in PUSH mode.			

7.2 Advanced test scenarios

7.2.1 MSD transfer to PSAP supporting IMS eCall over IPv4

Interoperability Test Description			
Identifier:	TD_ADV_01		
Objective:	Verify that the IVS is able to transfer the MSD (in an INVITE request) to a PSAP supporting IMS eCall, if IVS and PSAP are connected over IPv4.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.1.2 and 7.1.3 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_IPv4 AND PSAP_IPv4		
Pre-test conditions:	Default see clause 6.7: • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	check	IVS sends an INVITE request over IPv4
	3	check	PSAP verifies the MSD (in an INVITE request) is received over IPv4
	4	verify	PSAP verifies the MSD is correctly decoded
	5	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	6	verify	PSAP receives ACK request on 200 OK INVITE response
	7	check	MSD content at PSAP is identical to content transmitted by IVS

7.2.2 MSD transfer to PSAP supporting IMS eCall over IPv6

Interoperability Test Description			
Identifier:	TD_ADV_02		
Objective:	Verify that the IVS is able to transfer the MSD (in an INVITE request) to a PSAP supporting IMS eCall, if IVS and PSAP are connected over IPv6.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.1.2 and 7.1.3 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_IPv6 AND PSAP_IPv6		
Pre-test conditions:	Default see clause 6.7: • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	check	IVS sends an INVITE request over IPv6
	3	check	PSAP verifies the MSD (in an INVITE request) is received over IPv6
	4	verify	PSAP verifies the MSD is correctly decoded
	5	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	6	verify	PSAP receives ACK request on 200 OK INVITE response
	7	check	MSD content at PSAP is identical to content transmitted by IVS

7.2.3 MSD transfer to PSAP supporting IMS eCall over IPv4(IVS)/IPv6(PSAP)

Interoperability Test Description			
Identifier:	TD_ADV_03		
Objective:	Verify that the IVS is able to transfer the MSD (in an INVITE request) to a PSAP supporting IMS eCall, if IVS is connected over IPv4 and PSAP is connected over IPv6.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.1.2 and 7.1.3 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_IPv4 AND PSAP_IPv6		
Pre-test conditions:	Default see clause 6.7: • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	check	IVS sends an INVITE request over IPv4
	3	check	PSAP verifies the MSD (in an INVITE request) is received over IPv6
	4	verify	PSAP verifies the MSD is correctly decoded
	5	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	6	verify	PSAP receives ACK request on 200 OK INVITE response
	7	check	MSD content at PSAP is identical to content transmitted by IVS

7.2.4 MSD transfer to PSAP not supporting IMS eCall

Interoperability Test Description			
Identifier:	TD_ADV_04		
Objective:	Verify that the IVS is able to transfer the MSD via in-band modem to a PSAP not supporting IMS eCall.		
Configuration:	NG_eCall_CFG_02		
References:	Clause 7.4.3 of CEN TS 17184:2018 [4] Clause 5.1.6.11.2 (2nd numbered list/item 1) of ETSI TS 124 229 [1]		
Applicability:	IVS_ims_eCall AND PSAP_legacy_eCall AND IVS_MSD_usingInBand_via_VoLTE AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7: • the PSAP shall not support IMS eCall • MNO needs to support IMS eCall to legacy eCall transfer • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	IVS sent an INVITE request (see note 1)
	3	verify	The IMS network routes the emergency INVITE request towards the appropriate PSAP
	4	verify	The INVITE request is sent to a gateway function for interfacing to the CS domain
	5	verify	The gateway function sends a notification request to the appropriate PSAP
	6	verify	The emergency voice call establishment is completed with a voice path only
	7	verify	The IVS receives a 200 (OK) response to the INVITE (generated by the gateway) that lacks an ACK for the MSD
	8	verify	The IVS shall attempt to transfer the MSD to the PSAP via in-band modem within the IMS eCall (see note 2)
	9	verify	PSAP immediately transmits SEND-MSD (START) message without waiting for the valid Initiation Signal (see note 3)
	10	verify	If IVS had started to send an INITIATION message then IVS stopped sending the INITIATION message on receipt of the SEND-MSD message from the PSAP
	11	verify	PSAP verifies MSD is received
	12	verify	Verify the MSD is correctly decoded
	13	check	MSD content at PSAP is identical to content transmitted by IVS
	14	verify	PSAP sends acknowledgement
	15	verify	Verify that the IVS has stopped transmitting the MSD
	16	verify	2-way speech can be exchanged
NOTE 1: The INVITE request shall contain: - The eCall type of emergency service indication (automatic, manual) but shall not include the initial MSD in case the PS access is available, but the IVS does not detect the "IMS eCall supported" indicator. - The initial MSD and the eCall type of emergency service indicator (automatic, manual) if the IVS detected the "IMS eCall supported" indicator. NOTE 2: The test steps 9 to 15 are copied from clause 7.1.1 of ETSI TS 103 428 [9]. Other tests from ETSI TS 103 428 [9] could also be tested here. NOTE 3: Step 9 is only applicable if the PSAP is configured in PULL mode and should be skipped, if PSAP is configured in PUSH mode. NOTE 4: MSC of MSD transfer to a non IMS PSAP is shown in Figure 12.			

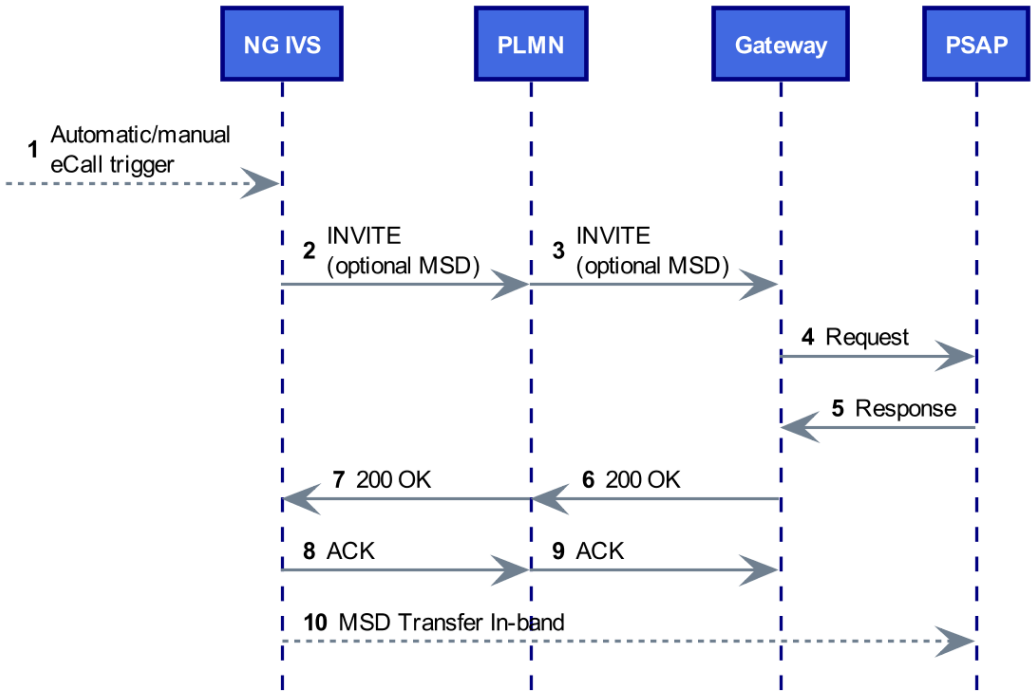

Figure 12: MSD transfer to a non IMS PSAP

1) The NG IVS sends an instruction to establish a manual or automatic NG eCall.

2) An initial emergency INVITE is sent to the PLMN. The INVITE may optionally contain the initial MSD and the eCall type of emergency service indicator (automatic, manual).

3) The PLMN network routes the emergency INVITE towards the appropriate PSAP. In this call flow, the appropriate PSAP is accessed over the gateway function and the CS domain after translating the eCall type of emergency service indication into the corresponding PSAP.

4) The Gateway forwards the request to the legacy PSAP.

5) The PSAP answers the eCall to the gateway.

6) The gateway sends the 200 OK to the PLMN.

7) The PLMN forwards the 200 OK to the NG IVS.

8) The NG IVS sends ACK for the 200 OK INVITE.

9) The gateway receives ACK for the 200 OK INVITE from the PLMN.

10) The IVS shall attempt to transfer the MSD to the PSAP via the eCall in-band modem.

7.2.5 IMS eCall establishment with IMS emergency registration

Interoperability Test Description			
Identifier:	TD_ADV_05		
Objective:	Verify that the IVS is able to initiate an IMS emergency session with IMS emergency registration.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.3.6 of CEN TS 17184:2018 [4] Clause 7.2 of ETSI TS 123 167 [2] Clause 5.2.2.3 of ETSI TS 123 228 [3]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	IVS sends a REGISTER request to initiate IMS emergency registration (see note 1)
	3	check	"sos" is present within the Contact header field of REGISTER request (see note 2)
	4	verify	IVS receives a 200 OK REGISTER response
	5	verify	IVS sends an INVITE request
	6	verify	PSAP verifies the MSD (in an INVITE request) is received
	7	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	8	verify	PSAP receives ACK request on 200 OK INVITE response
NOTE 1: MSC of IMS emergency registration procedure (step 2) is shown in Figure 13. NOTE 2: The test step 3 is optional, if there is no possibility to check the REGISTER message.			

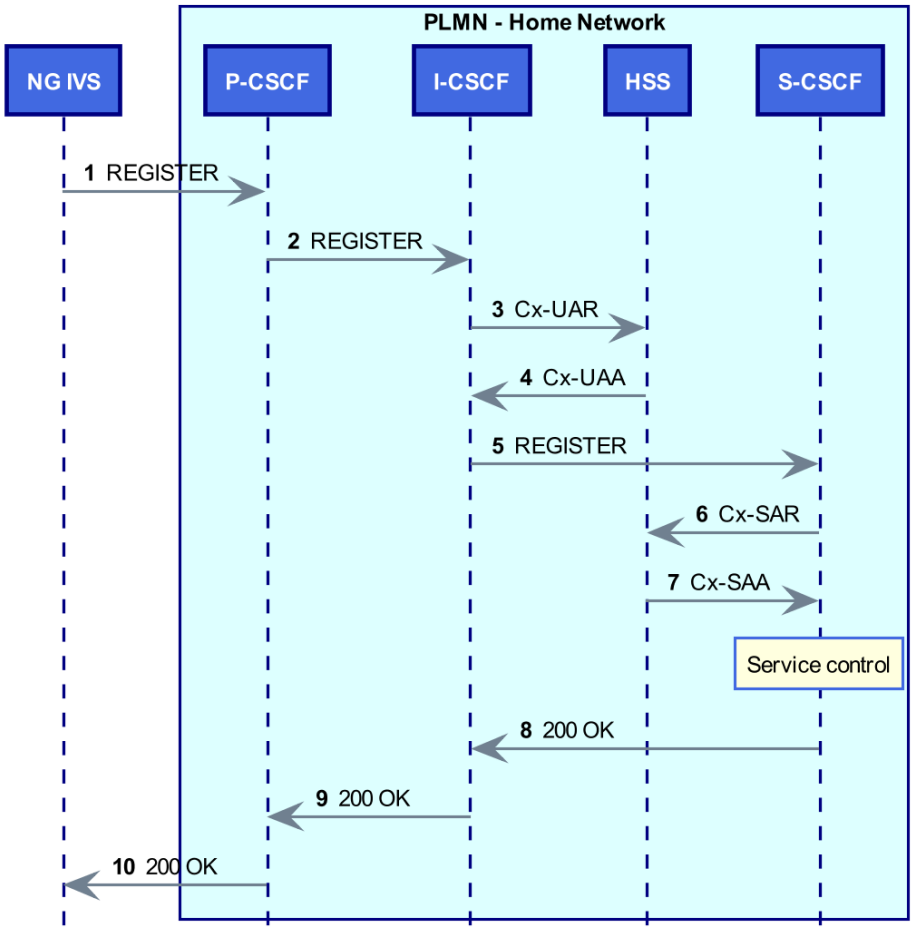

Figure 13: IMS emergency registration - IVS not registered

1) NG IVS sends REGISTER to the PLMN (P-CSCF).
2) P-CSCF sends REGISTER to the I-CSCF.
3) I-CSCF sends Diameter UA-Request to the HSS.
4) HSS sends Diameter UA-Answer to the I-CSCF.
5) I-CSCF send REGISTER to the S-CSCF.
6) S-CSCF sends Diameter SA-Request to the HSS.
7) S-CSCF receives Diameter SA-Answer from the HSS.
8) After successful confirmation S-CSCF sends 200 OK REGISTER to the I-CSCF.
9) I-CSCF forwards 200 OK REGISTER to the P-CSCF.
10) NG IVS receives 200 OK from the PLMN (P-CSCF).

7.2.6 IMS eCall establishment without IMS emergency registration

Interoperability Test Description			
Identifier:	TD_ADV_06		
Objective:	Verify that the IVS is able to initiate an IMS emergency session without IMS emergency registration and includes the "anonymous user" indication in the emergency session establishment, if GIBA is not supported.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.3.6 of CEN TS 17184:2018 [4] Clause 7.4 and Annex K of ETSI TS 123 167 [2]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND NOT IVS_GIBA		
Pre-test conditions:	Default see clause 6.7: • P-CSCF should not reject "anonymous user"		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	IVS sends a REGISTER request to initiate IMS emergency registration
	3	verify	IVS receives any 4XX response to REGISTER
	4	check	IVS sends an INVITE request with "anonymous user" indication to establish the eCall after unsuccessful registration
	5	verify	PSAP verifies the MSD (in an INVITE request) is received
	6	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	7	verify	PSAP receives ACK request on 200 OK INVITE response

7.2.7 IMS eCall establishment without IMS emergency registration GIBA supported

Interoperability Test Description			
Identifier:	TD_ADV_07		
Objective:	Verify that the IVS is able to initiate an IMS emergency session without IMS emergency registration and includes the "anonymous user" indication in the emergency session establishment, if GIBA is supported.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.3.6 of CEN TS 17184:2018 [4] Clause 7.4 and clause K.3 step 9 of ETSI TS 123 167 [2] Clauses 5.1.1.2.6 (c, d), 5.1.1.4.6 (c, d) and 5.1.1.6.6 (c, d) of ETSI TS 124 229 [1]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_GIBA		
Pre-test conditions:	Default see clause 6.7: • P-CSCF should not reject "anonymous user"		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	IVS sends a REGISTER request to initiate IMS emergency registration
	3	verify	IVS receives 420 response to REGISTER
	4	verify	IVS sends a new REGISTER request with temporary public user identity derived from the IMSI and without Authorization header field
	5	verify	IVS receives 200 OK REGISTER response
	6	check	IVS sends an INVITE request with "anonymous user" indication to establish the eCall after unsuccessful registration
	7	verify	PSAP verifies the MSD (in an INVITE request) is received
	8	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	9	verify	PSAP receives ACK request on 200 OK INVITE response

7.3 Advanced IVS test scenarios

7.3.1 Fallback to legacy eCall following busy during call setup

Interoperability Test Description			
Identifier:	TD_ADV_IVS_01		
Objective:	Verify that the IVS is able to fallback to legacy eCall after the IVS receives a 486 (Busy Here), 600 (Busy Everywhere) or 603 (Decline) response with a positive acknowledgment for the MSD to the INVITE request.		
Configuration:	NG_eCall_CFG_02		
References:	Clauses 7.1.2, 7.1.4, 7.3.6 and Table 1 of CEN TS 17184:2018 [4] Clause 5.1.6.11.2 (2nd numbered list/item 3) of ETSI TS 124 229 [1]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_legacy_eCall AND PSAP_legacy_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7: • The PSAP should be configured to send 486 (Busy Here), 600 (Busy Everywhere) or 603 (Decline) response with a positive acknowledgment for the MSD to the INVITE request • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives a 486 (Busy Here), 600 (Busy Everywhere) or 603 (Decline) response with a positive acknowledgment for the MSD to the INVITE request
	5	verify	PSAP receives ACK on 486 (Busy Here), 600 (Busy Everywhere) or 603 (Decline) response
	6	verify	IVS re-attempts the eCall due to domain selection rules
	7	verify	The IVS shall attempt to transfer the MSD to the PSAP via in-band modem in CS domain (see note 1)
	8	verify	PSAP answers call and immediately transmits SEND-MSD (START) message without waiting for the valid Initiation Signal (see note 2)
	9	verify	If IVS had started to send an INITIATION message then IVS stopped sending the INITIATION message on receipt of the SEND-MSD message from the PSAP
	10	verify	PSAP verifies MSD is received
	11	verify	Verify the MSD is correctly decoded
	12	check	MSD content at PSAP is identical to content transmitted by IVS
	13	verify	PSAP sends acknowledgement
	14	verify	Verify that the IVS has stopped transmitting the MSD
	15	verify	2-way speech can be exchanged
NOTE 1: The test steps 8-14 are copied from clause 7.1.1 of ETSI TS 103 428 [9]. Other tests from ETSI TS 103 428 [9] could also be tested here. NOTE 2: Step 8 is only applicable if the PSAP is configured in PULL mode and should be skipped, if PSAP is configured in PUSH mode. NOTE 3: MSC of fallback scenario is shown in Figure 14.			

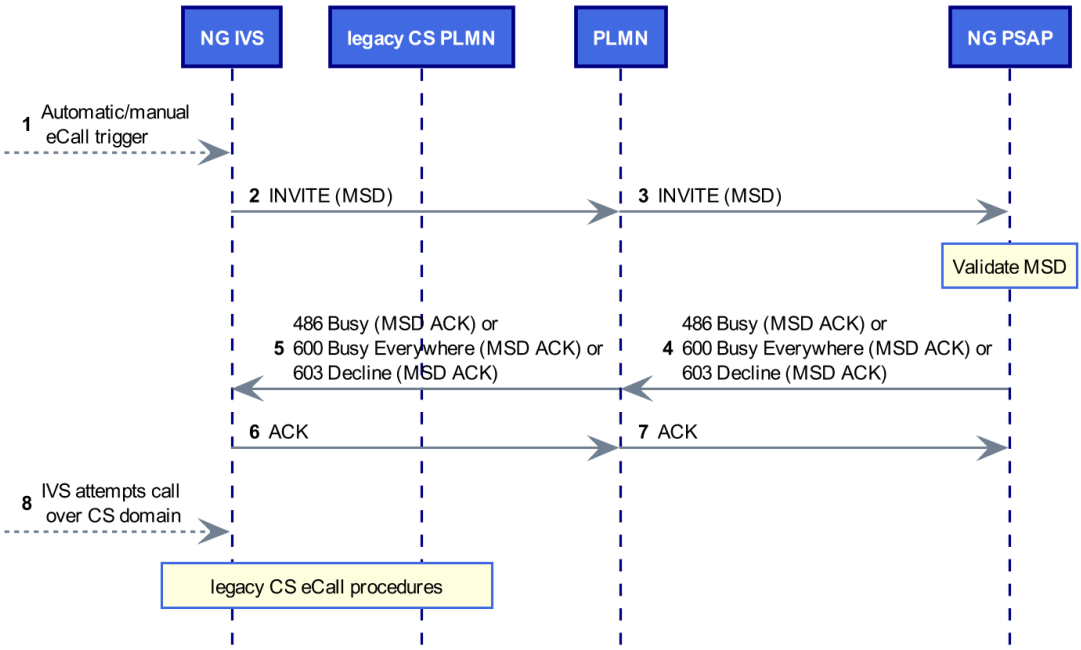

Figure 14: Fallback scenario

1) The NG IVS sends an instruction to establish a manual or automatic NG eCall.

2) An initial emergency INVITE is sent to the PLMN. The INVITE shall contain the initial MSD and the eCall type of emergency service indicator (automatic, manual).

3) The PLMN network routes the INVITE towards the appropriate NG PSAP.

4) MSD is received and due to busy NG eCall the NG PSAP returns a response (486 or 600 or 603) which includes a positive or negative acknowledgement for the initial MSD.

5) The PLMN network sends the response (486 or 600 or 603) to the NG IVS.

6) The NG IVS sends ACK for the response.

7) The NG PSAP receives ACK for the response from the PLMN.

8) IVS attempts call over CS domain.

7.3.2 Fallback to legacy eCall following unavailable response during call setup

Interoperability Test Description			
Identifier:	TD_ADV_IVS_02		
Objective:	Verify that the IVS is able to fallback to legacy eCall after the IVS receives a 480 (Temporarily Unavailable) response to the INVITE request.		
Configuration:	NG_eCall_CFG_02		
References:	Clauses 7.1.2, 7.3.6 and Table 1 of CEN TS 17184:2018 [4] Clauses 5.1.6.11.2 (2nd numbered list/item 4) and 5.2.10.3 of ETSI TS 124 229 [1]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_legacy_eCall AND PSAP_legacy_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7: • The PSAP should be configured to send 480 (Temporarily Unavailable) response for the MSD to the INVITE request • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	IVS receives a 480 (Temporarily Unavailable) response for the MSD to the INVITE request
	4	verify	PSAP receives ACK on 480 (Temporary Unavailable) response
	5	verify	IVS re-attempts the eCall due to domain selection rules
	6	verify	The IVS shall attempt to transfer the MSD to the PSAP via in-band modem in CS domain (see note 1)
	7	verify	PSAP answers call and immediately transmits SEND-MSD (START) message without waiting for the valid Initiation Signal (see note 2)
	8	verify	If IVS had started to send an INITIATION message then IVS stopped sending the INITIATION message on receipt of the SEND-MSD message from the PSAP
	9	verify	PSAP verifies MSD is received
	10	verify	Verify the MSD is correctly decoded
	11	check	MSD content at PSAP is identical to content transmitted by IVS
	12	verify	PSAP sends acknowledgement
	13	verify	Verify that the IVS has stopped transmitting the MSD
	14	verify	2-way speech can be exchanged
NOTE 1: The test steps 7 to 13 are copied from clause 7.1.1 of ETSI TS 103 428 [9]. Other tests from ETSI TS 103 428 [9] could also be tested here. NOTE 2: Step 7 is only applicable if the PSAP is configured in PULL mode and should be skipped, if PSAP is configured in PUSH mode.			

7.3.3 Fallback to legacy eCall following no-answer during call setup

Interoperability Test Description			
Identifier:	TD_ADV_IVS_03		
Objective:	Verify that the IVS is able to fallback to legacy eCall, if there is no-answer (e.g. 200 OK INVITE response) from the PSAP except optional 100 (Trying) or 180 (Ringing).		
Configuration:	NG_eCall_CFG_02		
References:	Clauses 7.1.2, 7.3.6 and Table 1 of CEN TS 17184:2018 [4] Clauses 5.1.6.11.2 (2nd numbered list/item 4) and 5.2.10.3 of ETSI TS 124 229 [1]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_legacy_eCall AND PSAP_legacy_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7: • The PSAP should be configured to send no-answer (e.g. 200 OK INVITE response) except optional 100 (Trying) or 180 (Ringing) • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	IVS receives no-answer (e.g. 200 OK INVITE response) except optional 100 (Trying) or 180 (Ringing)
	4	verify	PSAP receives a CANCEL request (see note 1)
	5	verify	IVS receives 200 OK CANCEL response
	6	verify	IVS receives 487 (Request Terminated) response
	7	verify	PSAP receives ACK request
	8	verify	IVS re-attempts the eCall due to domain selection rules
	9	verify	The IVS shall attempt to transfer the MSD to the PSAP via in-band modem in CS domain (see note 2)
	10	verify	PSAP answers call and immediately transmits SEND-MSD (START) message without waiting for the valid Initiation Signal (see note 3)
	11	verify	If IVS had started to send an INITIATION message then IVS stopped sending the INITIATION message on receipt of the SEND-MSD message from the PSAP
	12	verify	PSAP verifies MSD is received
	13	verify	Verify the MSD is correctly decoded
	14	check	MSD content at PSAP is identical to content transmitted by IVS
	15	verify	PSAP sends acknowledgement
	16	verify	Verify that the IVS has stopped transmitting the MSD
	17	verify	2-way speech can be exchanged
NOTE 1: The test steps 4 to 7 are optional. NOTE 2: The test steps 10 to 16 are copied from clause 7.1.1 of ETSI TS 103 428 [9]. Other tests from ETSI TS 103 428 [9] could also be tested here. NOTE 3: Step 10 is only applicable if the PSAP is configured in PULL mode and should be skipped, if PSAP is configured in PUSH mode. NOTE 4: MSC of no answer scenario is shown in Figure 15.			

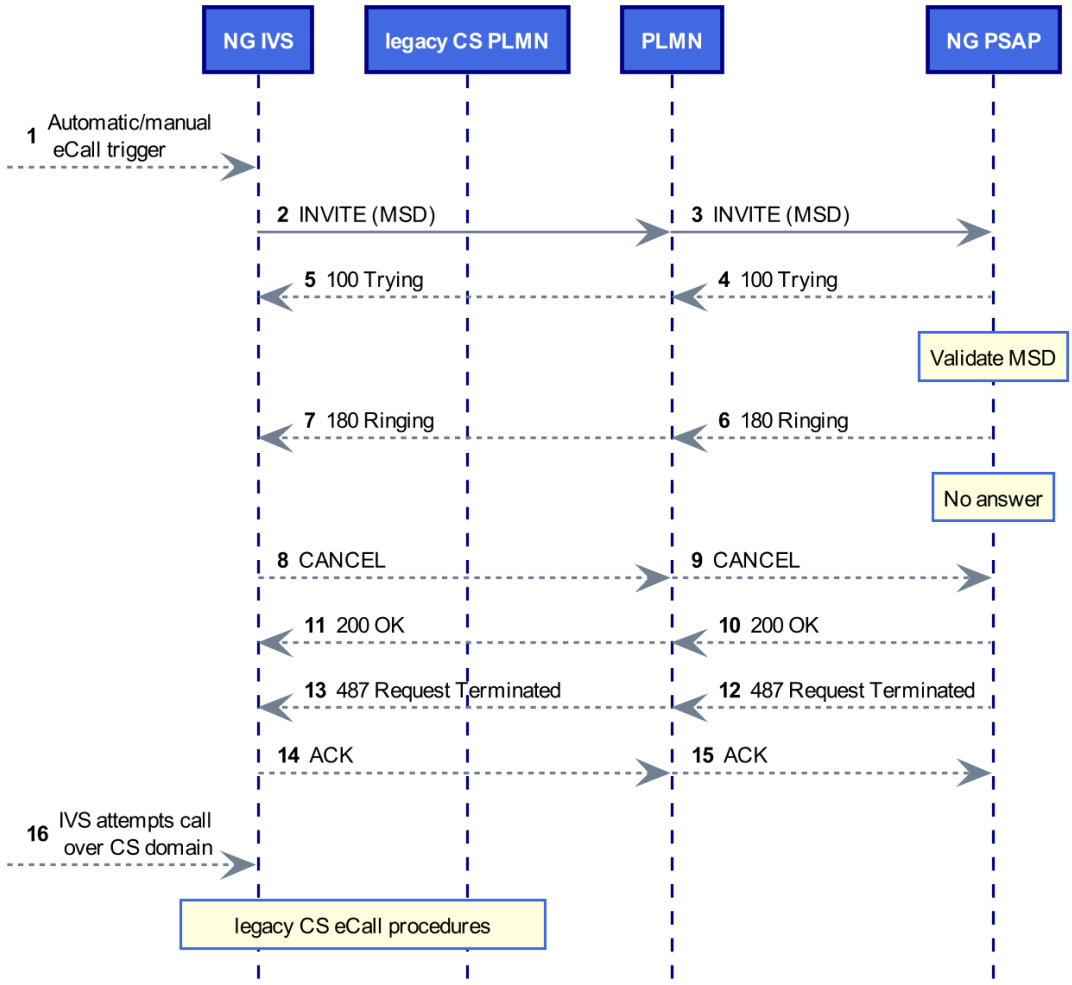

Figure 15: No-answer scenario

1) The NG IVS sends an instruction to establish a manual or automatic NG eCall.
2) An initial emergency INVITE is sent to the PLMN. The INVITE shall contain the initial MSD and the eCall type of emergency service indicator (automatic, manual).
3) The PLMN network routes the INVITE towards the appropriate NG PSAP.
4) NG PSAP may respond with 100 Trying to the PLMN.
5) PLMN may send 100 Trying to NG IVS.
6) NG PSAP may send 180 Ringing to the PLMN.
7) PLMN may send 180 Ringing to the NG IVS.
8) After no-answer is received NG IVS optionally sends CANCEL request to the PLMN.
9) PLMN resends CANCEL to the NG PSAP.
10) NG PSAP responds with 200 OK CANCEL to the PLMN.
11) PLMN resends 200 OK CANCEL to the NG IVS.
12) NG PSAP sends 487 Request Terminated response to the PLMN.
13) PLMN resends 487 Request Terminated response to the NG IVS.
14) NG IVS sends ACK request to the PLMN.

15) The NG PSAP receives ACK for the response from the PLMN.

16) IVS attempts call over CS domain.

7.3.4 Dropped eCall after MSD has been acknowledged

Interoperability Test Description			
Identifier:	TD_ADV_IVS_04		
Objective:	Verify that the IVS does not attempt to establish a new eCall, if the IMS eCall dropped after the eCall has been successfully established and the MSD has been acknowledged. Verify that the IVS answers a PSAP callback.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.3.6, 7.10, 7.11 and 7.14.7 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	verify	2-way speech can be exchanged
	7	stimulus	Simulate a call drop
	8	verify	IVS does not attempt to establish new eCall
	9	stimulus	PSAP initiates a callback (via INVITE request) using IVS callback number, SIP identifier or IP address
	10	verify	IVS confirms the call with a 200 OK INVITE
	11	verify	PSAP sends ACK request on OK INVITE
	12	verify	2-way speech can be exchanged

7.3.5 Dropped eCall before call has been established

Interoperability Test Description			
Identifier:	TD_ADV_IVS_05		
Objective:	Verify that the IVS attempts a new eCall in CS domain, if the IMS eCall dropped before the call has been established.		
Configuration:	NG_eCall_CFG_02		
References:	Clauses 7.3.6 and 7.13.3 of CEN TS 17184:2018 [4] Clause 5.1.6.11.2 (2nd numbered list/item 4) of ETSI TS 124 229 [1]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_legacy_eCall AND PSAP_legacy_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7: • The PSAP should be configured to send no 200 OK INVITE response in step 3 • PSAP operator knows the content of the transmitted MSD		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	stimulus	PSAP sends no 200 OK INVITE response
	4	stimulus	Simulate a call drop before the call has been established (before the IVS received a 200 OK INVITE response)
	5	verify	IVS re-attempt the eCall due to domain selection rules
	6	verify	The IVS shall attempt to transfer the MSD to the PSAP via in-band modem in CS domain (see note 1)
	7	verify	PSAP answers call and immediately transmits SEND-MSD (START) message without waiting for the valid Initiation Signal (see note 2)
	8	verify	If IVS had started to send an INITIATION message then IVS stopped sending the INITIATION message on receipt of the SEND-MSD message from the PSAP
	9	verify	PSAP verifies MSD is received
	10	verify	Verify the MSD is correctly decoded
	11	check	MSD content at PSAP is identical to content transmitted by IVS
	12	verify	PSAP sends acknowledgement
	13	verify	Verify that the IVS has stopped transmitting the MSD
	14	verify	2-way speech can be exchanged
NOTE 1: The test steps 7 to 13 are copied from clause 7.1.1 of ETSI TS 103 428 [9]. Other tests from ETSI TS 103 428 [9] could also be tested here. NOTE 2: Step 7 is only applicable if the PSAP is configured in PULL mode and should be skipped, if PSAP is configured in PUSH mode.			

7.3.6 IVS configured for 'eCall only' service (restricted)

Interoperability Test Description			
Identifier:	TD_ADV_IVS_06		
Objective:	Verify that the IVS does not attempt network registration until an eCall is initiated, if configured for 'eCall only' service.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.1.4 and 7.1.6 of CEN TS 17184:2018 [4] Clause 10.7 of ETSI TS 122 101 [11]		
Applicability:	IVS_ims_eCall AND IVS_eCall_only		
Pre-test conditions:	• IVS is configured for 'eCall only' service (restricted) • Ignition is OFF and NG IVS is in mobile network coverage • NG MNO and NG PSAP test points are available • NG IVS configured to support IMS communication profile		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS power on
	2	verify	IVS does not attempt to register on PLMN
	3	stimulus	IVS initiates an eCall (manual, automatic, test or reconfiguration)
	4	verify	IVS performs IMS emergency registration
	5	verify	PSAP verifies the MSD (in an INVITE request) is received
	6	verify	PSAP verifies the MSD is correctly decoded

7.3.7 eCall is attempted when no networks are available (limited service condition with forbidden PLMN on SIM/USIM)

Interoperability Test Description			
Identifier:	TD_ADV_IVS_07		
Objective:	Verify that an eCall is attempted when the IVS is in mobile network coverage but no networks are available for registration (limited service condition due to forbidden PLMN on SIM/USIM).		
Configuration:	NG_eCall_CFG_03		
References:	Clauses 7.3.5 and 7.13.2 of CEN TS 17184:2018 [4] Clause 10.7 of ETSI TS 122 101 [11]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	• Ignition is OFF and NG IVS is in mobile network coverage • NG MNO and NG PSAP test points are available • NG IVS configured to support IMS communication profile • NG IVS contains USIM with forbidden PLMN (limited service condition)		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS power on
	2	verify	IVS does not attempt to register on PLMN due to limited service condition
	3	stimulus	IVS initiates a test eCall
	4	verify	IVS does not attempt to register on PLMN due to limited service condition
	5	stimulus	IVS initiates an eCall (manual or automatic)
	6	verify	IVS performs IMS emergency registration
	7	verify	PSAP verifies the MSD (in an INVITE request) is received
	8	verify	PSAP verifies the MSD is correctly decoded
NOTE: To test the IVS behaviour in limited service condition it is also possible to use a mobile network simulator, which is rejecting the IVS attempts to register to the mobile network.			

7.3.8 MSD transfer to PSAP supporting IMS eCall via PLMN without VoIMS support

Interoperability Test Description			
Identifier:	TD_ADV_IVS_08		
Objective:	Verify that the IVS is able to transfer the MSD (in an INVITE request) to a PSAP supporting IMS eCall via a mobile network without VoIMS support.		
Configuration:	NG_eCall_CFG_06		
References:	Clause 7.3.6 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	• The network shall indicate support of IMS Emergency Services (EMS) and eCall Over IMS (ECL) and shall not indicate support of Voice over IMS over PS sessions (VoIMS). • Ignition is OFF and NG IVS is in mobile network coverage, but VoIMS is not supported • NG MNO and NG PSAP test points are available • NG IVS configured to support IMS communication profile • NG IVS contains USIM		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS power on
	2	verify	IVS registers to the PLMN but does not attempt IMS registration due to missing VoIMS support indication
	3	stimulus	IVS initiates an eCall
	4	verify	IVS performs IMS emergency registration
	5	verify	PSAP verifies the MSD (in an INVITE request) is received
	6	verify	PSAP verifies the MSD is correctly decoded

7.3.9 Termination of manually triggered eCall by vehicle occupant

Interoperability Test Description			
Identifier:	TD_ADV_IVS_09		
Objective:	Verify that the vehicle occupant is able to abort a manually triggered eCall before expiry of timer T1.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.3.8 and Table A.1 of CEN TS 17184:2018 [4] Clause 7.10.3 of CEN EN 16072:2015 [7]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	Default see clause 6.7: • IVS timer T1 shall not be set to 0.		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates a manual eCall
	2	verify	IVS does not send an INVITE request
	3	stimulus	Terminate the eCall before expiry of timer T1
	4	verify	eCall is terminated successfully

7.3.10 Termination of automatically triggered eCall by vehicle occupant not allowed/not possible

Interoperability Test Description			
Identifier:	TD_ADV_IVS_10		
Objective:	Verify that the vehicle occupant is not able to abort an automatically triggered eCall.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.3.8 of CEN TS 17184:2018 [4] Clause 7.10.3 of CEN EN 16072:2015 [7]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an automatic eCall
	2	stimulus	Try to terminate or abort the eCall
	3	verify	eCall established successfully and was not terminated

7.3.11 Ongoing eCall shall not be disconnected if new trigger is received

Interoperability Test Description			
Identifier:	TD_ADV_IVS_11		
Objective:	Verify that the IVS does not attempt to establish a new eCall on new trigger during ongoing eCall, if the eCall has been successfully established and the MSD has been acknowledged before.		
Configuration:	NG_eCall_CFG_01		
References:	Clauses 7.3.3 and 7.3.6 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_speech AND PSAP_speech		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives a 200 OK INVITE response with a positive acknowledgment for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	verify	2-way speech can be exchanged
	7	stimulus	Stimulate manual trigger or stimulate sensor
	8	verify	IVS does not attempt to establish new eCall and does not disconnect the ongoing eCall
	9	verify	2-way speech can be exchanged

7.4 Advanced PSAP test scenarios

7.4.1 PSAP handling of more than 1 eCall simultaneously

Interoperability Test Description			
Identifier:	TD_ADV_PSAP_01		
Objective:	Verify that a PSAP is able to receive and process more than 1 eCall simultaneously from different IVS devices.		
Configuration:	NG_eCall_CFG_04		
References:	Clause 7.1 of CEN EN 16072:2015 [7] Clause 7.8.1(first dashed line) of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND PSAP_simult_eCalls		
Pre-test conditions:	Default see clause 6.7: • PSAP has the ability to answer and process more than 1 eCall simultaneously • All involved IVS with ignition are ON and in mobile network coverage • PSAP Operator/s ready to receive eCalls • PSAP ready to collect MSD information and timing		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	All IVSs initiate an eCall to the same PSAP (using their allocated numbers or URNs)
	2	verify	PSAP verifies the calls are established
	3	verify	PSAP verifies that MSDs are correctly received and acknowledged (see note)
	4	stimulus	The eCalls are queued for PSAP operator or routed to different operators
	5	stimulus	The eCalls are answered either in-turn or simultaneously
	6	verify	Establishment of voice communication between the PSAP operator(s) and the IVS(s), and that the correct MSD information is displayed for each call
	7	stimulus	PSAP operator(s) clears down calls (via BYE request)
	8	verify	All IVSs cleared down the calls (confirmed with 200 OK BYE response)
NOTE: The PSAP shall be able to collect the information about the successful MSD reception and related timing for the evaluation. The PSAP shall be able to queue multiple calls until an operator answers the call.			

7.4.2 PSAP correct MSD additional data decoding

Interoperability Test Description			
Identifier:	TD_ADV_PSAP_02		
Objective:	Verify that the PSAP is able to decode optional additional MSD data.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.7.2 of CEN EN 16072:2015 [7] Clause 6.1.5 of CEN EN 15722:2015 [10]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall AND IVS_add_MSD_data		
Pre-test conditions:	Default see clause 6.7: • PSAP operator knows the content of the transmitted MSD, including the optional additional MSD data		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	check	MSD content (including the optional additional MSD data) at PSAP is identical to content transmitted by IVS

7.4.3 Rerouting to another PSAP/emergency control centre

Interoperability Test Description			
Identifier:	TD_ADV_PSAP_03		
Objective:	Verify that the PSAP is able to reroute the eCall to another PSAP/emergency control centre and voice connection is established with new PSAP.		
Configuration:	NG_eCall_CFG_05		
References:	Clause 7.12 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	Default see clause 6.7: • Execute the complete test TD_BAS_04		
Test Sequence:	**Step**	**Type**	**Description**
	1	verify	2-way speech can be exchanged between IVS and PSAP
	2	stimulus	PSAP operator reroutes eCall to another PSAP or emergency control centre
	3	verify	eCall is forwarded to new PSAP
	4	verify	2-way speech can be exchanged between IVS and new PSAP

7.4.4 PSAP operator user interface

Interoperability Test Description			
Identifier:	TD_ADV_PSAP_04		
Objective:	Verify that the PSAP user interface displays caller identity, caller location and MSD.		
Configuration:	NG_eCall_CFG_01		
References:	Clause 7.8.3 of CEN TS 17184:2018 [4]		
Applicability:	IVS_ims_eCall AND PSAP_ims_eCall		
Pre-test conditions:	Default see clause 6.7		
Test Sequence:	**Step**	**Type**	**Description**
	1	stimulus	IVS initiates an eCall
	2	verify	PSAP verifies the MSD (in an INVITE request) is received
	3	verify	PSAP verifies the MSD is correctly decoded
	4	verify	IVS receives the 200 OK INVITE response with positive acknowledgement for the MSD
	5	verify	PSAP receives ACK request on 200 OK INVITE response
	6	check	PSAP user interface displays caller identity, caller location and MSD

Annex A (informative): Source code of MSC figures

A.1 Overview

MSC figures were produced with the open-source tool PlantUML [i.4], which allows to create UML diagrams from a plain text language. Source code of the figures are contained in archive ts_103683v010101p0.zip which accompanies the present document.

History

Document history		
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